CHARGE NUMBER: 2501

PROJECT TITLE: Nuclear and Radiochemistry of Smoke

PROJECT LEADER: Roger A. Comes

PERIOD COVERED: August 1-31, 1981

DATE OF REPORT: September 9, 1981

## $^{14}$C-Menthol Study[1]

Samples of the cigarettes spiked with $^{14}$C(U)-menthol on 7/17/81 have been sectioned, extracted, and counted to determine if the menthol has equilibrated throughout the rod and filter. The cigarettes stored at 70°F and 65% RH had not reached equilibrium after 32 days. A single cigarette was placed in a 38°C oven for 5 days. Only a slight improvement was noted in the overall cigarette specific activity and a loss of some menthol is suspected under these conditions. The cigarettes will, therefore, continue to be stored under normal conditions until equilibrium is reached.

## Harvey Oxidizer[2,3,4]

The problems encountered with the Oxidizer have apparently been solved. Two approaches have led to satisfactory results being obtained. A return to the original liquid scintillation cocktail as supplied by the manufacturer has, for unexplained reasons, given acceptable data. In addition, a modification to the instrument has been made which allows the placement of the sample in a "cool zone" outside the combustion zone until $O_2$ flow is re-established. Both of these techniques are under further investigation to determine the best approach to finally settle on.

## Low Level Laboratory[5]

Considerable progress has been made on the construction of the LLL. Exterior and interior block work is about 50% complete. The slab has been poured, the utilities tunnel to the power plant is nearing completion, drain pipes have been laid and electrical conduit and wall fixtures are being installed.

In conjunction with the construction, various building materials have been evaluated for their natural radioactivity levels. Total alpha plus beta activities ranging from 0.81 pCi/g for a "River Bed Aggregate" to 15.65 pCi/g for a "Light Granite" sample have been found. A sample of lightweight block was rejected based on its high beta activity. Samples of the mix used to pour the slab are currently under investigation. Monitoring of all building materials will continue.

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Cooked Flavors[6]

Ether extracts of 17 samples of cooked flavors (supplied by Charge Number 2305) were analyzed by capillary gas chromatography and GC-MS. The flavor samples were previously evaluated subjectively by application to and subsequent smoking of cigarettes. The samples were thus graded as to their relative acceptability. An analytical method was needed to verify this subjective evaluation and to allow future prediction for QA purposes. Results of the above GC analyses indicated that this analytical procedure or a variant of it might provide such a verification based on the amounts of certain organic acids present in the samples. Results and methodology were communicated to members of Charge Number 2305 and the development of the exact method turned over to the Analytical Research Division (Charge Number 1756).

Miscellaneous[1,5,7,8]

1. Two lectures were given to personnel of the Analytical Division. The first was largely devoted to a discussion of the theoretical background related to radiochemistry and radiochemical measurements. The second involved health physics and laboratory procedures for handling radioactive materials with particular emphasis on carbon-14. The personnel attending were those who may be involved in various chemical analyses to be performed on carbon-14 and other radioactive materials.

2. A Special Report (Acc. #81-207), "WS-14 (N-t-butyl-p-menthane-3-carboxamide) as an Additive to Cigarette Paper", by A. F. Frisch and R. A. Kornfeld was issued.

3. A paper, "Preparation of $^{14}$C-Labelled Poly (ℓ-Menthyl Isopropenyl Carbonates)" by R. A. Comes and H. J. Grubbs was published in the Journal of Labelled Compounds and Radiopharmaceuticals, Vol. XVIII, No. 6, 769 (1981).

4. A course, "Environmental Occupational Radiation Protection," at the Harvard School of Public Health was attended by A. Frisch the week of August 24-28.

5. A new tissue solubilizer has been obtained (Soluene®-350) and is under evaluation for use in determining specific activities on leaf and filler samples. To date it appears that digestion of tobacco materials is possible in a much shorter period of time than previously possible. Further studies are underway with various materials.

6. The GLRC (micro set-up) has been modified to accept a glass liner in the injection port. A 50m methyl-silicone capillary column was installed; a pressure regulated split-splitless injection system was fabricated and installed. Column efficiency has been optimized using injections of corn-mint oil and counting efficiency established at 3-4% with $^{14}$C-toluene.

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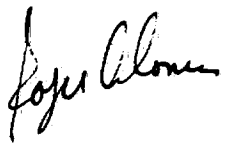
Various $^{14}C$-labelled materials will be run to determine the versatility of the present system.

7. Optimization of counting techniques for $^{45}Ca$ containing materials continues. In addition, $^{45}CaCl_2$ has been applied to cigarettes and total smoke distribution studies are underway.



References


1. M. Chavis NB 7615
2. K. Barlow NB 7547
3. B. Francis NB 7486
4. R. Newman NB 4818
5. A. Frisch NB 7309
6. D. Douglas NB 7064
7. F. Greene NB 7336
8. G. Segura NB 7502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